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Heuristics, Biases, and the Importance of Gatekeeping

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INTRODUCTION

"Visions of Rationality"–the topic of this Symposium–pervade evidence scholarship and rule of law principles. The rule of law is often described as a search for truth in a system that aspires to rationality.[1] The question begged,

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1. *See* Scott Brewer, *Exemplary Reasoning: Semantics, Pragmatics, and the Rational Force of Legal Argument by Analogy*, 109 HARV. L. REV. 923, 929 (1996) (explaining that the "normative order constituted by the legal system, informed by 'rule of law' principles as well as by many others, aspires to be rational in significant ways"). Asserting truth and rationality goals tends to make people nervous in a postmodern world, where people doubt the achievability of truth, where many believe truth is contextual and different perspectives on truth abound. *See, e.g.*, DENNIS PATTERSON, LAW AND TRUTH 150 (1996) (characterizing postmodernism as emphasizing the idea that "no practice or discourse enjoys a privileged position vis-a-vis others" and asserting that "truth in law is a matter of the forms of legal argument"). Some postmodern scholars ditch the concept of law as a search for truth entirely, seeing it rather as a contest for power. *See, e.g.*, Carrie Menkel-Meadow, *The Trouble with the Adversary System in a Postmodern, Multicultural World*, 38 WM. & MARY L. REV. 5, 13 (1996) (arguing that the adversary system is not a search for truth but a contest, the goal of which is to

of course, is what is rationality? In attempting to answer this question, this essay explores rationality, both in terms of how people think–the domain of cognitive psychology–and in terms of what goals people are attempting to achieve. Truth and rationality have a purpose: they are harnessed to the rule of law as a vital safeguard from the paradox of freedom in democracies, in which (if not restrained) the strong–physically or economically–defeat the freedom that enabled them by preying on the weak.[2] Thus, the rationality that concerns evidence scholars is the way in which legal process and the thought processes of legal decisionmakers interact.

One of the key features of legal process–at least in the United States–is the jury.[3] Although the jury system, which provides a structure for citizen participation and brings the voice of the community into the process of legal decisionmaking,[4] and is integral to the separation of powers doctrine[5]--the bifurcation of decisionmaking duties between judge and jury has consequences. One of the primary consequences of the jury system is the restriction on the information that the jury will be able to use for its

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win). However, this article argues that just because our attempts to discover the truth may be only relatively successful, just because we may have different perspectives on what is truth does not mean that the search should be abandoned, or that the effort to improve the process is unavailing. For an amusing and enlightening explanation of why both visions (law as truth search and law as contest) may be correct, see Arthur Allen Leff, *Law and,* 87 YALE L.J. 989, 1003 (1978) (acknowledging that although the adversary system "does seem more or less well adapted to providing the more or less accurate data needed for the rational operation of the [system and is] . . . largely capable of answering the question 'what happened' at the legally relevant time" there are important ways in which it is also a contest).

2. *See* K. R. POPPER, 2 THE OPEN SOCIETY AND ITS ENEMIES 124 (5th ed., rev. 1966) (discussing the paradox of freedom); WILLIAM TWINING, THEORIES OF EVIDENCE: BENTHAM AND WIGMORE 90 (1985) (explaining the truth theory of adjudication as the foundation of good government and remarking that "justice absolutely depends upon it").

3. *See* RITA J. SIMON, THE JURY: ITS ROLE IN AMERICAN SOCIETY 6-7 (1980) (describing the role of popular participation in the administration of justice).

4. *See* Charles W. Wolfram, *The Constitutional History of the Seventh Amendment*, 57 MINN. L. REV. 639, 653-56, 654 n.47 (1973) (discussing the British circumvention of the colonists' right to trial by jury as a significant cause of the American revolution).

5. *See generally id.*, at 653-71 (discussing the jury as a popular check on the three branches of government). Even federal judges, with their life tenure, are subject to political pressure, a point that worried the framers and was a subject of discussion during the ratification debates. *See id.* at 695-96. The jury was expected to restore community values to what might otherwise become arbitrary decisionmaking. *See* 2 BERNARD SCHWARTZ, THE BILL OF RIGHTS: A DOCUMENTARY HISTORY 3-16 (1971) (discussing the function of the jury as a bulwark against tyranny).

determination.[6] The idea that some evidence should be kept from the jury because it is irrelevant, unhelpful, confusing, a waste of time, or unduly prejudicial, is seen by some as unfairly maligning the jury.[7]

One especially rancourous area has been the use of expert witnesses and the necessity of judicial screening for validity before permitting experts to testify. After the Supreme Court's *Daubert* trilogy of cases,[8] the question for admissibility of scientific evidence now is whether the testimony has met the standards and methods of science.[9] Even in state courts that have eschewed the *Daubert* standard in favor of the old general acceptance rule, there is an increased concern with scientific validity. In earlier articles,[10] I addressed whether judges were equipped to evaluate the validity of experts, and–concluding that they could–offered a framework for undertaking the enterprise.[11] In this essay, I would like to suggest some reasons why the judge is the appropriate decisionmaker, and why, from a cognitive standpoint, it is important to the goal of rationality that the judge perform this screening function.

This is no denigration of the jury. The judge should perform this function not because judges are innately more thoughtful or responsible than jurors, but because a structured inquiry into scientific validity for which they will be held accountable forces judges to engage in what Professor Gregory Mitchell refers to as "active, open-minded thinking."[12] A basic insight of the

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6. *See, e.g.*, Richard D. Friedman, *Minimizing the Jury Over-Valuation Concern*, 2003 MICH. ST. L. REV. 967, 967 (noting that "we are told that although an item of evidence is probative, it must be excluded because the jury will give it too much weight" and searching for "other grounds for exclusion" although noting that "in some other settings we might instead decide that the best result is admission of the evidence").

7. *See id.* at 969-71 (arguing that fear of jury over-valuation of evidence is unwarranted).

8. *See* Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579 (1993) (requiring judicial gatekeeping for scientific validity); Gen. Elec. Co. v. Joiner, 522 U.S. 136 (1997); Kumho Tire Co. v. Carmichael, 526 U.S. 137 (1999) (extending the validity inquiry to technical as well as scientific evidence).

9. *See generally* ARTHUR FINE, THE SHAKY GAME: EINSTEIN, REALISM, AND THE QUANTUM THEORY (1986) (asserting that questions about the truth claims of science must be answered by reference to the methods and standards of science).

10. *See* Erica Beecher-Monas, *A Ray of Light for Judges Blinded by Science: Triers of Science and Intellectual Due Process*, 33 GA. L. REV. 1047, 1051 (1999).

11. *See* Erica Beecher-Monas, *The Heuristics of Intellectual Due Process: A Primer for Triers of Science*, 75 N.Y.U. L. Rev. 1563, 1589 (2000).

12. *See* Gregory Mitchell, *Mapping Evidence Law*, 2003 MICH. ST. L. REV. 1065, 1116, 1116-17 n.105 (defining active open-minded thinking as "willingness to consider new evidence and opposing arguments before reaching a conclusion" specifically consisting of "(1) search that is thorough in proportion to the importance of the question, (2) confidence that is appropriate to the amount and quality of thinking done, and (3) fairness to other possibilities than the one

common law system is that a structured reasoning process improves judgment.[13] Thus, in allocating the decision process between judge and jury, methodologies (such as the rules of evidence) should be employed in order–as much as possible–to implement rule of law principles–a notion of due process.[14] The aspiration to truth and rationality reflects a concern for accurate evidentiary input: in order to reach a justifiable decision, reasoning must be based on trustworthy information.[15] A third consequence of the aspiration to rationality is that even trustworthy facts must have some logical tendency to prove or disprove an issue in the case.[16]

This framework for justice is the inspiration for the rules of evidence, and a fundamental tenet is that only facts having relevance–rational probative

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we initially favor") (citing JONATHAN BARON, THINKING AND DECIDING 191-92 (3d ed. 2000)).

13. This insight has been borne out by the research of cognitive psychologists. *See, e.g.*, Philip E. Tetlock & Richard Boettger, *Accountability: A Social Magnifier of the Dilution Effect*, 57 J. PERSONALITY & SOC. PSYCHOL. 388 (1989).

14. In other words, there should be "a process reasonably designed to ascertain the truth." JOHN RAWLS, A THEORY OF JUSTICE 238 (rev. 1999) (1971). *See also* WILLIAM TWINING, RETHINKING EVIDENCE 107 (Northwestern Univ. Press 1990) (discussing the rationalist tradition in evidence scholarship and its main epistemological assumption that the purpose of adjudication is to discover an objectively knowable truth, while at the same time acknowledging that "the notion of 'fact' in adjudication is more problematic than the orthodox view suggests. . . . Thus it is misleading to suggest that legal enquiries into questions of fact are value-free") (footnotes omitted). Even law and economics adheres to the notion of legal process as a search for truth. *See, e.g.*, Richard A. Posner, *An Economic Approach to Legal Procedure and Judicial Administration*, 2 J. LEGAL STUD. 399 (1973). Posner states judicial error is "a source of social costs and the reduction of error is a goal of the procedural system." *Id.* at 401. That is why, Posner explains, a procedural rule such as the constitutional exclusionary rule "is exceptional, and is recognized–and often bitterly criticized–as such." *Id.*

15. The belief that decisions based on correct information come closer to the truth is the basis of normative epistemology, including "norms governing how individuals should acquire and weigh evidence as well as, ultimately, form beliefs." Ronald J. Allen & Brian Leiter, *Naturalized Epistemology and the Law of Evidence*, 87 VA. L. REV. 1491, 1498 (2001) (contending that the rules of evidence "structure the epistemic process by which jurors arrive at beliefs about disputed matters of fact at trials").

16. Sometimes this concept is called "materiality," and it is considered to be one of the generative principles of the law of evidence. *See* Robert P. Burns, *Notes on the Future of Evidence Law*, 74 TEMP. L. REV. 69, 70 (2001) (noting that the generative principle of materiality, now subsumed under the relevance requirement, permits into evidence only that evidence that is "'of consequence' to the *legitimate* determination of the action").

value–should be admissible in the search for truth.[17] The common law's long-standing requirement is that judges act as gatekeepers, screening irrelevant information from the jury and explaining the basis of their reasoning and that the basis be well-founded. This is the cornerstone of a system that aspires to rationality.[18] Although the meanings of truth and rationality are subject to debate in an open society, ultimately truth is empirical, and what we understand as rationality consists of a structured reasoning process relating perception to an explanation about how the world works.[19] This requires accurate information, and justifiable inferences.[20] In sum, the reason we need gatekeepers is to ensure that the statements offered into evidence comport with permissible legal theories, embedded as they are in cultural systems of belief, assumptions and claims about the world.[21] Although what we seek to

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17. The doctrines of relevance and probativity are expressed as follows under the federal rules of evidence: "'Relevant evidence' means evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence." FED. R. EVID. 401. And: "Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence." FED. R. EVID. 403. A corollary is that all facts that have rational probative value should be admissible unless forbidden under a competing concern of the justice system (stating an example may be the improper use of state power implicated in the exclusionary rule). *See* TWINING, *supra* note 14, at 152. *But see* Randolph N. Jonakait, *The Origins of the Confrontation Clause: An Alternative History,* 27 RUTGERS L.J. 77, 82 (1995) (contending that evidence law grew out of the adversarial system as part of the "Sixth Amendment rights that affirmatively grant an accused the opportunity for meaningful defense advocacy").

18. *See* Brewer, *supra* note 1, at 929 (exploring the rational force of reasoning from precedent, given that the "normative order constituted by the legal system, informed by 'rule of law' principles as well as by many others, aspires to be rational in significant ways").

19. *See* WILLARD V. QUINE, THE PURSUIT OF TRUTH 19 (1990) (describing rationality as a structured reasoning process relating sensory input to a web of theoretical output). Quine asserts that science is rational, as opposed to metaphysics, religion or astrology, because all questions are ultimately questions of empirical fact and science answers these questions more successfully. *See id.* For an elegant exposition of Quine's philosophy, see Brian Leiter, *Why Quine Is Not a Postmodernist,* 50 SMU L. REV. 1739 (1997).

20. In terms of the reasoning process, Quine does not see that there is anything special about scientific logic; it is just like common sense, only more careful. *See* W. V. QUINE, *The Scope and Language of Science, in* THE WAYS OF PARADOX AND OTHER ESSAYS 228, 233 (1976) ("The scientist is indistinguishable from the common man in his sense of evidence, except that the scientist is more careful.").

21. *See generally* WILLARD VAN ORMAN QUINE, *Two Dogmas of Empiricism, in* FROM A LOGICAL POINT OF VIEW 20 (2d ed., rev. 1980) (stating that knowledge is embedded in a network of meanings).

know are the facts, as Quine explains, facts are inevitably theory-laden.[22] Therefore, in an adversary system, it is the judge whose role it is to manage coherence by reference to what is relevant to the legal determination. This cornerstone, it turns out, has support in cognitive psychology.

This essay proceeds in four parts. Following the Introduction, Part I discusses the evidentiary concern about accurate information, the biological limitations of human information processing and the possibility of improving decisionmaking through training and repeat performance. Part II explores the application of epistemic norms to jury decisionmaking, addresses cognitive biases that may adversely affect jury decisionmaking, and explores the dynamics of group decisionmaking. Part III focuses as an example of group dynamics on the context of expert testimony on future dangerousness in capital sentencing proceedings. This essay concludes that rule of law aspirations to truth-seeking, rationality and justice are best served by having the jury decide life and death issues only after judicial gatekeeping for relevance and reliability.

I. STRUCTURED REASONING AND EMPIRICAL CORRESPONDENCE AS RATIONAL PREREQUISITES

The twin rule of law goals of truth and rationality mean that rationality does not operate in a closed system, but inevitably refers to the real world.[23] Justice and rationality only have meaning in the context of our underlying goals.[24] The requirements of coherence and correspondence are both prerequisites of a framework for justice.[25]

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22. *See* WILLARD V. QUINE, *Epistemology Naturalized*, *in* ONTOLOGICAL RELATIVITY AND OTHER ESSAYS 83 (1969) (explaining the "reciprocal containment" of "epistemology in natural science and science in epistemology"). Thus, Quine is committed to empiricism, but finds that knowledge and theory are inseparable. *See id.*

23. Descriptive claims, to be valid, must correspond to the natural world, offer a logical explanation, be falsifiable, and open to critique. *See* KARL R. POPPER, THE LOGIC OF SCIENTIFIC DISCOVERY 276-81 (Routledge, 1992). As Quine explained, "I see the question of truth as one to be settled within science, there being no higher tribunal." Willard V. Quine, *Comment on Lavener*, *in* PERSPECTIVES ON QUINE 229 (Robert B. Barrett & Roger F. Gibson eds., 1990).

24. In other words, the legal system can only be understood as an institution that implements the system of democratic governance we have chosen. Of course, even accepting a correspondence and coherence theory of rationality does not mean that all rational minds will agree on what justice requires. On the contrary, more than one theory can always be supported by the data. *See* QUINE, *supra* note 22, at 69 (explaining that the under-determination of theory by evidence means that more than one theory will always be supported by the data).

25. Professor Mitchell makes a distinction between psychological programs designed to test coherence rationality, in which the important variable is internal mathematical coherence

A. Accurate Information as a Prerequisite to Rationality

Many of the rules of evidence are based on a concern for accuracy. Witnesses with first-hand knowledge about the circumstances and people involved in a legal dispute are brought in to testify about their observations. Because they might lie, the witnesses are required to take an oath. Cross-examination is further designed to probe the accuracy of their statements.

One category of witnesses, however, is allowed to testify not because they have observed anything about the parties or the dispute for themselves, but because they have knowledge about how the world works–the scientific experts. With regard to scientific experts, the concern for accuracy is not that they will lie (although they are also required to take an oath), but twofold: first, whether their observations are accurate, and second, whether, given the state of knowledge about a particular scientific hypothesis proffered by the expert, that hypothesis is useful in resolving a legal dispute.[26] The purpose of the admissibility inquiry is to decide whether the expert can provide information to help the factfinder resolve an issue in the case.[27] That is, the judge must decide whether a descriptive claim about the world has sufficient indicia of reliability (the concern for accuracy) and relevance to the case at hand (the concern for rationality) to enter the courtroom. For many years, that inquiry was resolved by determining whether the expert's views were generally accepted by the scientific community.[28] There has been a major

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regardless of outcome accuracy, and correspondence rationality, in which the variable studied is how closely a person's judgment comes to empirical accuracy. *See* Mitchell, *supra* note 12, at 1129.

26. Bear in mind that the judge does not have to decide whether a given scientific hypothesis is actually correct. Rather, what the gatekeeper must determine is whether there are good grounds for the expert's testimony. Once this determination has been made, it remains the jury's province to decide which set of battling experts has the most persuasive argument.

27. *See* Anthony Z. Roisman, *The Courts,* Daubert, *and Environmental Torts: Gatekeepers or Auditors?* 14 PACE ENVTL. L. REV. 545, 548 (1997) (observing that "when experts offer conflicting opinions the court is not to decide which expert is correct").

28. For over seventy years, the only scientific evidence admissible in court was that which purported to reflect a consensus of the relevant scientific community. This was the standard articulated in *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923). This case explained that "while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs." *Frye*, 293 F. at 1014.

paradigm shift in the way courts and litigants approach scientific evidence[29] ever since the Supreme Court in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*[30] and its progeny[31] instructed the federal judiciary to make admissibility determinations based on analyzing the scientific validity of the proffered testimony, and on whether the testimony "fits" the issues in the case.

B. Heuristics and Biases

One of the key insights of cognitive psychology is that the use of heuristics–mental shortcuts–is a pervasive and constructive tool that humans employ to make sense of a complex world.[32] Lately heuristics have received a "bum rap" by being lumped together with "biases."[33] Heuristics, however,

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29. Like all paradigm shifts, this one has created a great deal of angst among those who operated under the old mental regime. *See, e.g.*, Daubert v. Merrell Dow Pharms., 43 F.3d 1311 (9th Cir. 1995). Judge Kozinski, on remand, complained that "though we are largely untrained in science and certainly no match for any of the witnesses whose testimony we are reviewing, it is our responsibility to determine whether those experts' proposed testimony amounts to 'scientific knowledge,' constitutes 'good science,' and was 'derived by the scientific method.'" *Daubert*, 43 F.3d at 1316.

30. 509 U.S. 579 (1993).

31. *See* Gen. Elec. Co. v. Joiner, 522 U.S. 136 (1997); Kumho Tire Co. v. Carmichael, 526 U.S. 137 (1999) (extending the validity inquiry to technical as well as scientific evidence).

32. *See* Gerd Gigerenzer & Daniel G. Goldstein, *Reasoning the Fast and Frugal Way: Models of Bounded Rationality*, 103 PSYCHOL. REV. 650, 651 (1996) (proposing models of bounded rationality that replace unrealistic views of the mind). People vary in their uses of heuristics internally, according to context and in comparison to other people. *See* Gregory Mitchell, *Why Law and Economics' Perfect Rationality Should Not Be Traded for Behavioral Law and Economics' Equal Incompetence*, 91 GEO. L.J. 67, 74-75 (2002) (explaining that there are "individual and situational differences in rational behavior" and noting that one should not "assume uniformity in cognitive performance across persons and situations that is not supported by the empirical data").

33. *See, e.g.*, Jeffrey J. Rachlinski, *Heuristics and Biases in the Courts: Ignorance or Adaptation?*, 79 OR. L. REV. 61, 61 (2000) (explaining that the brain's limited ability to process information leads people to rely on mental shortcuts, which "leaves people susceptible to all manner of illusions: visual, mnemonic, and judgmental"); James A. Fanto, *Quasi-Rationality in Action: A Study of Psychological Factors in Merger Decision-Making*, 62 OHIO ST. L.J. 1333, 1343 (2001) (noting that people "exhibit various biases that prevent or distort rational calculation"); Jon D. Hanson & Douglas A. Kysar, *Taking Behavioralism Seriously: The Problem of Market Manipulation*, 74 N.Y.U. L. REV. 630, 633 (1999) (observing that "cognitive illusions–sometimes referred to as biases–are not limited to the uneducated or unintelligent, and they are not readily capable of being unlearned") (footnotes omitted).

are a characteristically human way of processing information.[34] They can be extraordinarily helpful.[35] Indeed, some "satisficing" heuristics may be superior to rational algorithms in complex decision contexts.[36] Simplifying heuristics are especially useful in making complex decisions,[37] such as those confronting legal decisionmakers.

When cognitive psychologists refer to heuristics, however, they generally mean a largely unconscious method of processing information that can result in poor judgment and decisions with less than optimal consequences.[38] Although some scholars have questioned the applicability of heuristics and biases research beyond the context of the particular study,[39] virtually everyone agrees that sometimes heuristics can get in the way of

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34. Herbert Simon attacked the perfect rationality claims of classical economics and explained that people (like other creatures) have those cognitive abilities that best enabled them to survive and reproduce, and that "[b]ecause of the psychological limits of the organism (particularly with respect to computational and predictive ability), actual human rationality-striving can at best be an extremely crude and simplified approximation to the kind of global rationality that is implied, for example, by game-theoretical models." Herbert A. Simon, *A Behavioral Model of Rational Choice*, 69 Q. J. ECON. 99, 101 (1955). Notably, game theorists have modified their views somewhat since then, partly to accommodate ideas of bounded rationality. *See, e.g.*, DOUGLAS G. BAIRD ET AL., GAME THEORY AND THE LAW 11 (1994) (asserting that the game theory assumption of rationality "is not that individuals are self-interested profit-maximizers or care only about money, but rather that they act in a way that is sensible for them given their own tastes and predilections. . . . [I]ndividuals are likely to choose a particular strategy when they can always do better in their own eyes by choosing that strategy than by choosing any other"). The context of the game, the incentives of the players, information aggregation–herd behavior–all are important considerations for game theorists as well as cognitive psychologists. *See id.* at 189-218 (setting out some of these issues).

35. Indeed, I premised an earlier article on the notion that judges would make better admissibility decisions if they used the heuristic I proffered in evaluating scientific evidence. *See* Beecher-Monas, *supra* note 11, at 1563.

36. *See* Gigerenzer & Goldstein, *supra* note 32, at 650 (explaining that "proponents of the heuristics and biases program, who concluded that human inference is systematically biased and error prone" are mistaken about the degree of error induced by this method of reasoning, because in real-world situations characterized by "multiple pieces of information, which are not independent, but redundant", the complexity of the task makes satisficing algorithms superior for most tasks).

37. By complex, I mean decisions that have a number of alternative solutions, a quantity of information on which each alternative is based, and some time pressure. *See, e.g.*, JOHN W. PAYNE ET AL., THE ADAPTIVE DECISION MAKER 34 (1993) (noting that "as decisions become more complex , people will tend to use simplifying heuristics").

38. *See* Mitchell, *supra* note 32, at 79-80 (defining judgment as "the process of perceiving and cognitively integrating stimuli to form a 'global evaluation' about something" and decision as "the expression of a preferential choice" expressed in words, action or a commitment to a course of action).

39. Notable critics include Gerd Gigerenzer, Gregory Mitchell and Bradley Wendell.

optimal decisionmaking.[40] Some errors are the result of computational limitations.[41] Some are the result of memory restrictions. Others are more motivational in nature. All of these errors can lead to drastically poor decisions under the right circumstances.[42]

Despite the contentions of some scholars that these biases are artifacts of the experimental setting,[43] there is little question that rational choice models of human decisionmaking fail to reflect reality.[44] Where people make judgments under conditions of uncertainty (where there are no clear answers),

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40. *See, e.g.*, Robyn M. Dawes, *Behavioral Decision Making and Judgement, in* THE HANDBOOK OF SOCIAL PSYCHOLOGY 497 (Daniel T. Gilbert et al. eds., 4th ed. 1998) [hereinafter HANDBOOK SOC. PSYCHOL.] (explaining that if actual decision making violates certain principle of rationality "*systematically* (not just as a result of unreliability or 'error'), this deviation is termed an *anomaly*–if the people who violate these principles simultaneously accept them as ones that they believe *should* govern their decision making"); G. Gigerenzer, *The Bounded Rationality of Probabilistic Mental Models, in* RATIONALITY: PSYCHOLOGICAL AND PHILOSOPHICAL PERSPECTIVES 284 (K.I. Manktelow & D.E. Over eds., 1993) (presenting a process theory of overconfidence bias successfully predicting conditions under which overestimation occurs). Notably, even Professor Mitchell, who derides as "misleading" the equation of heuristics and biases with error in legal judgment, concludes that "[t]he interesting and important question for empirical research on legal judgment and decision-making is not whether judges or jurors ever fall prey to systematic biases and errors in their reasoning–some surely do–but rather what contexts foster good and bad reasoning." Mitchell, *supra* note 12, at 1147. This essay offers an analysis of the allocation of decisionmaking between judge and jury that demonstrates how gatekeeping requirements foster good reasoning.

41. *See, e.g.*, GERD GIGERENZER, CALCULATED RISKS: HOW TO KNOW WHEN NUMBERS DECEIVE YOU 242-43 (2002) (training students to draw conclusions from numbers is more successful if they are taught to translate probabilistic statistics into frequentist representations).

42. *See* Tetlock & Boettger, *supra* note 13, at 388 (explaining that people "use different information-processing strategies in different situations" so that, for example, the pressure to justify one's views may actually magnify the dilution effect).

43. *See, e.g.*, Mitchell, *supra* note 12, at 1082 (asserting that "[a]doption of the strong form of the 'legal actor as cognitive miser' proposition, which posits that systematic bias and error will infect all legal judgments, is not justifiable given the normative, methodological, and empirical limitations on the heuristics and biases research program"). Notably, this essay does not assert that all legal judgments are "infected" by irrationality. Rather, I argue that the rule of law goals of rationality and truth are better met by structuring the decision process in such a way as to take into account the way people think, and that doing so can improve the quality of judgment and decisionmaking. Even such skeptics as Professor Mitchell acknowledge that "there is indisputable empirical proof that humans often fail to achieve perfect rationality in their judgment and decision-making behavior." *Id.* at 1083 n.22. It is the goal of this essay to examine whether the requirement of judicial gatekeeping can assist in the goal of achieving rationality.

44. *See, e.g.*, Bernard Grofman, *On the Gentle Art of Rational Choice Bashing, in* INFORMATION, PARTICIPATION, AND CHOICE 239, 240 (Bernard Grofman ed., 1993) ("Only an idiot (or an economist) would claim that rational choice models can explain all of human behavior.").

they are particularly likely to use short-cuts.[45] People using these heuristics may be behaving rationally in the sense of conserving time, but their decisions differ from what the rational actor approach of economics would have predicted.[46] Judgmental accuracy may also be impaired.

Professor Mitchell has raised the question of how generalizable the findings of cognitive psychology are to legal applications.[47] He points out many of the limitations of laboratory studies, and questions their relevance to the context in which legal participants must make decisions.[48] The question of generalizability is an important one, although it is "never completely answerable."[49] The issues of how similar are the people studied to the people to whom the results will be applied, and the similarity between the situations

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45. These "quirks" are often called heuristics and biases, but whatever they are called, the idea is that people take cognitive shortcuts as a strategy for processing information. *See* PAYNE ET AL., *supra* note 37, at 2 (explaining that strategies for processing information vary from the rational choice model when people are faced with complex choice problems with many alternatives). These are not irrational responses, although the resulting decision may be less than optimal. *See id.* (noting that "people have multiple goals including to be accurate and the desire to conserve cognitive resources"). As Professor Mitchell points out, some people exhibit these quirks more than others, and in some contexts more than others. *See* Mitchell, *supra* note 32, at 74-75 (explaining that there are "individual and situational differences in rational behavior" and noting that one should not "assume uniformity in cognitive performance across persons and situations that is not supported by the empirical data"). Nonetheless, the unconscious tendency of most people to take these cognitive shortcuts has been well documented in a number of situations applicable to jury decisionmaking, and understanding these tendencies and how to counteract them can vastly improve the way information is presented by experts and understood by juries.

46. In other words, individual behavior may systematically depart from the formal axioms of rationality supplied by expected utility theory. *See* Christine Jolls et al., *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471, 1477 (1998).

47. *See* Mitchell, *supra* note 12, at 1106.

48. *See id.* at 1107.

49. John Monahan & Laurens Walker, *Social Authority: Obtaining, Evaluating, and Establishing Social Science in Law*, 134 U. PA. L. REV. 477, 506 (1986) (quoting DONALD T. CAMPBELL & JULIAN C. STANLEY, EXPERIMENTAL AND QUASI-EXPERIMENTAL DESIGNS FOR RESEARCH 5 (1963)) (explaining how to evaluate "how far beyond the specific facts of the study validly-produced research findings remain valid").

investigated and those of current interest are both important inquiries.[50] Nevertheless, there are good reasons to generalize from the cognitive studies of each of the anomalies discussed in this essay.

First, people are biologically very similar.[51] Second, biologically speaking, people's thought processes develop as the brain does, and these thought processes are remarkably consistent across cultures.[52] Although people unquestionably have different cultural experiences that influence their thinking to some degree, there are basic similarities in memory and learning that are pervasive and transcend language and culture. More research would, as always, be helpful, but that does not make inferences from the existing data illegitimate.

Although human memory and attention are limited because of brain structure and function, across cultures people tend to make inferences as though both were infallible, resulting in cognitive short-cuts.[53] These are unconscious processes, and doubtlessly enable people to make decisions that are fast, and, on average, accurate enough.[54] It also keeps people from being

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50. *See id.* For example, college students are often used in cognitive studies. Because these students are "on average, younger, brighter, and more affluent than the typical jury population", one may question whether the study results are applicable to jury decisionmaking. *See id.* at 506-07. But one can disregard the results only if youth, affluence, or intelligence can be shown to affect the decision. Professor Mitchell has given us neither studies showing that they do, nor theory explaining why they should. In fact, in response to the critique about using college students and unrealistic laboratory conditions, a great deal of research has attempted more realistic studies, and those results incorporated into the jury deliberation literature. *See, e.g.*, Dennis J. Devine et al., *Jury Decision Making: 45 Years of Empirical Research on Deliberating Groups*, 7 PSYCHOL. PUB. POL'Y & L. 622 (2001). The cognitive heuristics and biases research program has been remarkably resilient. As Monahan and Walker explain: "The trustworthiness of a study increases as independent investigators arrive at a common conclusion. The more often a study is confirmed by subsequent research, the less likely it is that chance fluctuations in the data accounted for the results of the original research." *See* Monahan & Walker, *supra* note 49, at 508.

51. Memory, for example, is a dynamic systemic property of neurons in which the brain records how the body explores and reacts to the world. *See* ANTONIO R. DAMASIO, THE FEELING OF WHAT HAPPENS: BODY AND EMOTION IN THE MAKING OF CONSCIOUSNESS 15-19 (1999).

52. For a discussion of the cross-cultural use of metaphor, see STEVEN L. WINTER, A CLEARING IN THE FOREST: LAW, LIFE, AND MIND (2001).

53. *See* Jeffrey J. Rachlinski, *The "New" Law and Psychology: A Reply to Critics, Skeptics, and Cautious Supporters*, 85 CORNELL L. REV. 739, 750 (2000) (observing that "people make inferences based on attention and memory as if these processes are infallible, even though both are error-prone").

54. *See* Gigerenzer & Goldstein, *supra* note 32, at 651, 655 (designing and empirically testing satisficing algorithms of bounded rationality against statistically rational algorithms to solve real world problems of limited knowledge and finding that the statisficing algorithms scored the highest proportion of correct inferences in the shortest time).

paralyzed into inaction.[55] Although this may confer an evolutionary advantage to humans as a species, it does not lead to optimal decisionmaking in all situations.[56] In other words, the satisficing[57] strategies that people adopt to solve complex problems with limited resources may have long-term value for humans as a species, but they can also lead to errors in judgment.[58]

C. A Structured Reasoning Process Improves Judgment

These kinds of systematic decision errors in judgment are not irremediable. Decisions that are less than optimal because of statisficing strategies can be improved.[59] People benefit from decision aids.[60] Training in reasoning improves performance dramatically.[61] People can be taught to think correctly and to retain this knowledge.[62] People are capable of sound reasoning if the information is presented to them correctly.[63] That is why it is essential that the legal system–aspiring as it does to rationality–ought to identify the conditions under which the use of otherwise helpful heuristics

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55. *See, e.g.*, SHELLEY E. TAYLOR, POSITIVE ILLUSIONS: CREATIVE SELF-DECEPTION AND THE HEALTHY MIND 212-14 (1989) (noting that the only people who do not suffer from overoptimism bias about their chances for success in the future are the clinically depressed).

56. *See* Dawes, *supra* note 40, at 497 (explaining that if actual decision making violates certain principle of rationality "*systematically* (not just as a result of unreliability or 'error'), this deviation is termed an *anomaly*–if the people who violate these principles simultaneously accept them as ones that they believe *should* govern their decision making").

57. *See* Simon, *supra* note 34, at 101 (explaining "satisficing" as the concept that while human rationality may not meet the economic goals of rational self-maximizing, it is usually good enough to achieve most of the goals of the individual under most of the circumstances the individual encounters).

58. *See* PAYNE ET AL., *supra* note 37, at 5 ("Flexibility in response may have long-run value; however, it unfortunately can also lead to short-term errors in judgment.").

59. *See id.* at 13 (noting the tradeoffs between accuracy and effort).

60. *See id.* at 7 (using the example of supermarket price unit information, which consumers tended to ignore until the format was changed, making the information more available by ranking unit prices from lowest to highest).

61. *See* Christopher Jepson et al., *Inductive Reasoning: Competence or Skill?*, 6 BEHAV. & BRAIN SCI. 494, 498 (1983) (discussing studies); Richard E. Nisbett et al., *Teaching Reasoning*, 238 SCI. 625, 630 (1987) (advocating formal training in the "rules underlying reasoning").

62. *See* GIGERENZER, *supra* note 41, at 242-43 (describing the successful training of students in making correct statistical inferences).

63. *See* Jonathan J. Koehler, *The Base Rate Fallacy Reconsidered: Descriptive, Normative, and Methodological Challenges*, 19 BEHAV. & BRAIN SCI. 1, 15 (1996) (citing studies demonstrating that when information is presented in certain ways people are capable of sound probabilistic reasoning).

may result in biased (less than optimal) decisionmaking and attempt to structure legal decisionmaking in such a way as to minimize these biases.[64]

For example, repeat decisionmaking in the presence of unambiguous feedback improves judgment.[65] As repeat decisionmakers on evidentiary issues, who get fairly unambiguous feedback in the form of reversals, the choice of judges for such tasks may make some sense. Moreover, we know that training is much more effective for pragmatic applications of reasoning than for abstract principles,[66] so that judicial training in how to apply *Daubert* principles may actually serve some useful purpose. In addition, the accountability of judges may improve their decisions in evidentiary matters.

Accountability, which refers to the expectation that one may have to justify one's actions,[67] can improve judgment if certain conditions are met.[68] An unknown audience that the decisionmaker views as legitimate may assist people who know that they will be held accountable beforehand in making better decisions by engaging in preemptive self-criticism, as long as there exist formal decision rules that can correct the mental processes involved.[69] Those

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64. *See, e.g.*, Mark Seidenfeld, *Cognitive Loafing, Social Conformity, and Judicial Review of Agency Rulemaking*, 87 CORNELL L. REV. 486, 547 (2002) (examining the implications of cognitive psychology for judicial review of agency rulemaking and concluding that one important mechanism for avoiding bad decisions is to hold decisionmakers responsible for their choices, and that "[i]f structured properly, accountability can attenuate many of the systematic biases that flow from improper use of decisionmaking shortcuts").

65. *See, e.g.*, Koehler, *supra* note 63, at 6 (citing studies showing that people learned to use base rates more effectively after receiving feedback about their errors from their experience; for example, physicians who learned the low base rate of pneumonia from their practice experience relied heavily on the base rate when making diagnoses, and auditors "learned and used the base rate for financial statement errors most easily by directly experiencing those errors"; but cautioning that "personally experienced base rates were used only by those who also experienced the relationship between the base rate and the diagnostic information").

66. *See* Patricia W. Cheng et al., *Pragmatic Versus Syntactic Approaches to Training Deductive Reasoning*, *in* RULES FOR REASONING 186 (Richard E. Nisbett ed., 1993) (noting that "[t]he near total ineffectiveness of purely abstract training in logic contrasts dramatically with the ready ease with which people seem able to apply a naturally acquired pragmatic reasoning schema" and noting that people "who received a brief training session on the obligation schema improved markedly on selection problems interpretable in terms of that schema").

67. *See* Jennifer S. Lerner & Philip E. Tetlock, *Accounting for the Effects of Accountability*, 125 PSYCHOL. BULL. 255, 255 (1999) (reviewing the literature on accountability).

68. *See id.* at 270 ("This review underscores the falsity of the conventional wisdom . . . that accountability is a cognitive or social panacea. . . .").

69. The necessary conditions are, principally, "an audience (a) whose views are unknown, (b) who is interested in accuracy, (c) who is interested in processes rather than specific outcomes, (d) who is reasonably well-informed, and (e) who has a legitimate reason for inquiring into the reasons behind participants' judgments." *Id.* at 259. Lerner and Tetlock

appear to be the conditions of a judge making decisions about evidentiary admissibility, but not those of a jury.

II. JURY DECISIONMAKING ABOUT SCIENTIFIC EVIDENCE

Evidence rules–or the lack of them–determine what information the jury will be able to use for its determination.[70] The purpose of permitting experts–witnesses without personal knowledge of the defendant or incident–to testify is to inform the jury about matters outside their common experience. Why, however, do we need gatekeepers? Does judicial gatekeeping actually promote more accurate and more rational legal decisionmaking?[71]

The question of whether initial screening by the judge for scientific validity is necessary for rationality is one on which even the Supreme Court is divided. The Supreme Court in *Barefoot v. Estelle*[72] thought the adversary system could be relied upon to present enough information to jurors so that they could sort reliable from unreliable expert testimony. The *Daubert* Court thought expert testimony needed to be screened for relevance first. Which Court was correct?

A. Cognitive Biases that May Affect Evidence Evaluation

Judges and juries must make decisions that have a number of alternative solutions, the choice of which will vary based on the information presented,

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explain that while process accountability increases both accuracy and calibration (the correlation between accuracy and confidence), outcome accountability decreases calibration and increases judgment inconsistency, but they also note that "there is no reason to suppose that all kinds of [process accountability] will work the same way." *Id.* at 258.

70. *See* Brian Leiter, *The Epistemology of Admissibility: Why Even Good Philosophy of Science Would Not Make for Good Philosophy of Evidence*, 1997 BYU L. REV. 803, 809 (explaining that if *Frye* is wrong, it is for reasons of law, not reasons of science, because the epistemic norms in science and law are different). I agree with Professor Leiter that the rules of admissibility need to be evaluated in terms of the goals of law rather than the goals of science, but I disagree with his conclusion that jurors are as competent as judges in evaluating junk science. *See* Erica Beecher-Monas, *Blinded by Science: How Judges Avoid the Science in Scientific Evidence*, 71 TEMP. L. REV. 55, 75 (1998).

71. The question asked by social epistemology is what norms work best under the real world limits of a particular social practice. *See* Leiter, *supra* note 70, at 814-17 (suggesting two lines of inquiry: "paternalism," whether substituting judicial screening will enable jurors to make more accurate decisions; and "ought implies can," that is, whether shortcomings in cognition will preclude either judges or jurors from making an accurate decision).

72. 463 U.S. 880 (1983) (refusing to exclude future dangerousness testimony as a constitutional matter because the defense could not show that "psychiatrists are always wrong with respect to future dangerousness, only most of the time").

and they must make these decisions within a limited time frame. This is the definition of complex decisionmaking and it has implications for the quality of the judgment reached. Empirically, juries have difficulty in assessing scientific testimony.[73] So do judges.[74]

However, although judges are just as prone to use unconscious shortcuts as juries, there are a number of factors that counteract this tendency in judges. First, the structured reasoning process undertaken in a *Daubert* inquiry improves performance in cognitive tasks.[75] Second, judges are repeat players in the way that juries are not. Repeat exposure to the decisionmaking task–at least in the presence of feedback–can improve performance.[76] Third, judges are accountable, at least in some respects; they must present the basis for their decisions, and that basis is subject to scrutiny and to being overruled by a higher court. Accountability, which is difficult to achieve for group

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73. *See* Daniel A. Krauss & Bruce D. Sales, The Effects of Clinical and Scientific Expert Testimony on Juror Decision Making in Capital Sentencing, 7 PSYCHOL. PUB. POL'Y & L. 267, 270 (2001) (research suggests that jurors are incapable of differentiating more scientifically valid expert testimony from less accurate testimony).

74. In a study of state court judges, Sophia I. Gatowski and her colleagues found that although judges overwhelmingly endorsed a gatekeeping role for judges even in those states following the general consensus standard, a fair percentage of them could not apply the standards correctly. *See* Sophia I. Gatowski et al., *Asking the Gatekeepers: A National Survey of Judges on Judging Expert Evidence in a Post-*Daubert *World,* 25 LAW & HUM. BEHAV. 433 (2001) (finding that with respect to the most important inquiries, falsifiability and error rate, thirty-five percent of judges' explanations of falsifiability were unequivocally wrong, ten percent were wrong in their assessment of error rate and eighty-six percent gave error rates that were equivocal). For a critique of courts post-*Daubert* handling of scientific evidence, see *Developments in the Law: Confronting the New Challenges of Scientific Evidence,* 108 HARV. L. REV. 1481 (1995).

75. *See* Jepson et al., *supra* note 61, at 498 (discussing studies indicating that training in reasoning improves performance dramatically); Nisbett et al., *supra* note 61, at 630 (advocating formal training in the "rules underlying reasoning"). Training is much more effective for pragmatic applications of reasoning than for abstract principles. *See* Cheng et al., *supra* note 66, at 186 (noting that "[t]he near total ineffectiveness of purely abstract training in logic contrasts dramatically with the ready ease with which people seem able to apply a naturally acquired pragmatic reasoning schema" and noting that people "who received a brief training session on the obligation schema improved markedly on selection problems interpretable in terms of that schema").

76. *See, e.g.*, Koehler, *supra* note 63, at 6 (citing studies showing that people learned to use base rates more effectively after receiving feedback about their errors from their experience; for example physicians who learned the low base rate of pneumonia from their practice experience relied heavily on the base rate when making diagnoses, and auditors "learned and used the base rate for financial statement errors most easily by directly experiencing those errors"; but cautioning that "personally experienced base rates were used only by those who also experienced the relationship between the base rate and the diagnostic information").

judgments, like those made by the jury, is more effective for individual decisionmakers, like a trial judge.[77] "Accountability for one's inferences produces more thorough and more elaborate processing that takes account of more information and that is, at least sometimes, more accurate than processing that occurs in the absence of accountability."[78] Individual judgments under conditions of accountability are more likely to be careful and thoughtful.[79] These studies indicate the soundness of judicial screening for relevance and reliability.

Jurors who are presented with expert testimony that has not been scrutinized for scientific validity may have a difficult time sorting the wheat from the chaff. A cognitive bias known as the dilution effect occurs when people are presented with complex information, some of which is relevant to the decision task and some of which is irrelevant.[80] The probability that a particular choice will be made should not vary with the amount of information available,[81] nor should irrelevant information enter into a judgment,[82] but it does.[83] The dilution effect occurs when irrelevant information dilutes relevant information, leading to less accurate judgments than when only relevant information was available.[84]

In studies of this effect, participants responded differently to stories detailing the same phenomenon but containing different amounts and kinds of

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77. *See* Kenneth L. Bettenhausen, *Five Years of Groups Research: What We Have Learned and What Needs to be Addressed*, 17 J. MGMT. 345, 361 (1991); *see also* Seidenfeld, *supra* note 64, at 544 (discussing the phenomenon of cognitive loafing).

78. Shelley E. Taylor, *The Social Being in Social Psychology*, *in* 1 HANDBOOK SOC. PSYCHOL., *supra* note 40, at 58, 76.

79. *See* Bettenhausen, *supra* note 77, at 361 (citing studies demonstrating that people in groups of sixteen who shared responsibility for the judgment task "used less complex judgment strategies than subjects working alone" although "multiple judges who expected to justify their judgments worked as hard as individual judges").

80. Some of the classic work on the dilution effect was that of Philip E. Tetlock and his co-authors. *See, e.g.*, Philip E. Tetlock et al., *The Dilution Effect: Judgmental Bias, Conversational Convention, or a Bit of Both?*, 26 EUR. J. SOC. PSYCHOL. 915, 916-17 (1996) (citing studies demonstrating that "linking diagnostic with nondiagnostic evidence produced more regressive predictions than people would otherwise have made").

81. *See* Naresh K. Malhotra, *Information Load and Consumer Decision Making*, 8 J. CONSUMER RES. 419 (1982) (discussing studies on information load effects).

82. *See* Dawes, *supra* note 40, at 537 (noting that "[s]omeone who has a strong opinion based on very clear evidence may be influenced to 'moderate' this opinion by exposure to a flurry of uninformative information").

83. *See id.* (stating that when people are considering evidence for a hypothesis, irrelevant information should be ignored, but it is not).

84. *See* N. John Castellan, Jr., *Multiple-Cue Probability Learning with Irrelevant Cues*, 9 ORG. BEHAV. & HUM. PERFORMANCE 16, 26 (1973) (stating that study participants were unable to ignore irrelevant information even after a large number of trials).

information.[85] Although the probability that a particular choice will be made should not vary with the number of irrelevant facts available,[86] irrelevant information that should not enter into a judgment nonetheless creeps in.[87] When people are asked to judge whether someone else has a particular characteristic, such as aggressiveness, their judgments tend to be more focused (and accurate) when they are presented with only relevant information; even when details are obviously irrelevant, they still appear to affect judgment.[88] Physical attractiveness of the defendant should not affect the verdict, for example, but a number of jury studies have shown a "leniency shift" toward an attractive defendant, but not for an unattractive defendant.[89]

Two heuristics are thought to underlie the dilution phenomenon: the representativeness heuristic and the norms of social discourse.[90] In the first explanation, the dilution problem arises because irrelevant information obscures what is relevant.[91] The representativeness heuristic is one in which people rely on representative patterns–stereotypes–in reaching a decision.[92] Rational choice and Bayes theorem predict that rational people consider the statistical probability that an event will occur and update it with particularized

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85. *See* Henry Zuckier, *The Dilution Effect: The Role of the Correlation and the Dispersion of Predictor Variables in the Use of Nondiagnostic Information*, 43 J. PERS. & SOC. PSYCHOL. 1163 (1982).

86. *See* Dawes, *supra* note 40, at 505 (explaining that dilution occurs "when evidence that does not distinguish between hypotheses in fact influences people to change their mind").

87. *See id.* at 537.

88. *See id.* at 532 ("Dilution effects occur when evidence that does not distinguish between hypotheses in fact influences people to change their mind.") (emphasis omitted).

89. *See* Devine et al., *supra* note 50, at 679 (citing mock jury studies by R.R. Izzet & W. Leginski, *Group Discussion and the Influence of Defendant Characteristics in a Simulated Jury Setting*, 93 J. SOC. PSYCHOL. 271 (1974); *See* Norbert L. Kerr et al., *Bias in Judgment: Comparing Individuals and Groups*, 103 PSYCHOL. REV. 687, 714-15 (1996) (describing the MacCoun (1990) study and finding its conclusion that dilution effects are greater among juries than individual jurors to be consistent with computer analyses).

90. *See* Seidenfeld, *supra* note 64, at 503.

91. "[D]ecisionmakers allow irrelevant information to alter the decisions that they would otherwise choose by considering only relevant information." *Id.* at 502 (using the example of a guess about a student's grade point average, where people gave very different predictions about a student's grade point average when they were told only the number of hours studied weekly than when they were told not only the number of hours studied but also how many plants the student kept). There are two major explanations for this effect, the representativeness heuristic, in which people select outcomes depending on the degree to which the evidence fits stereotypical patterns, and norms about social discourse, in which the experiment participants expect that information given them is relevant to their task. *See id.*

92. *See* Daniel Kahneman & Amos Tversky, *Subjective Probability: A Judgment of Representativeness*, 3 COGNITIVE PSYCHOL. 430 (1972). These shortcuts are not consciously employed, but operate on a subliminal level to affect decision. *See id.*

specific information. In fact, people ignore base rates[93] and adhere to stereotypes by overestimating the correlation between what something appears to be and what it is. For example, in assessing the career of a person described as overbearing, aggressive, rude, and skilled at rhetorical argument, people will refer mentally to known stereotypes rather than population base rates.[94] People think by association and respond to patterns–even infants recognize shape patterns.[95] This is a characteristic of human thought and undoubtedly speeds up the thinking process, but it has a downside.

The social norms heuristic (which is a second postulated reason for the dilution effect), hypothesizes that, in a testing context, people focus on social cues and assume that the experimenter would not be presenting them with

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93. The base rate is the frequency of a given subject in the population. For example, if a sample of one hundred people consists of seventy lawyers and thirty engineers, the base rate of lawyers is seventy percent, and of engineers, thirty percent. Knowing only that, if you were asked the occupation of any given person, you would be wise to answer "lawyer." Interestingly, most people do not. In a study in which subjects were divided into two groups, both of which were told that one hundred people were either lawyers or engineers, one subject group was told there were seventy lawyers and thirty engineers, the other group that there were thirty lawyers and seventy engineers, and both groups were given thumbnail descriptions of the people written by psychologists, designed to be nondiagnostic with respect to occupation. *See* Nisbett et al., *supra* note 61, at 625. In both groups, the subjects based their answers on stereotypes rather than population base rates. *See id.*

94. *See* Amos Tversky & Daniel Kahneman, *Availability: A Heuristic for Judging Frequency and Probability*, *in* JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES 163 (Daniel Kahneman et al. eds., 1982) [hereinafter Tversky & Kahneman, *Availability*]. There is an ongoing debate between Kahneman/Tversky and Gigerenzer about whether this is a reasoning error or not, with the focus of the disagreement on interpretations of probability. *See, e.g.*, Gigerenzer, *supra* note 40, at 291-97 (arguing that you cannot assign probabilities to unique events and that therefore there is no normative basis for assigning error to stereotyping, and suggesting errors are eliminated by asking questions in terms of frequencies rather than in terms of probabilities and increasing the use of random sampling); Daniel Kahneman & Amos Tversky, *On the Reality of Cognitive Illusions*, 103 PSYCHOL. REV. 582, 589 (1996) [hereinafter Kahneman & Tversky, *Reality*] (acknowledging that representation in terms of absolute frequencies improves accuracy, but citing studies to demonstrate that people nonetheless perceive correlations that do not exist and that "some significant judgmental biases are not readily corrected by the observation of natural frequencies"). For purposes of our discussion, it is enough to note that both sides agree that information is rarely presented to decisionmakers in a form–frequency that is optimal for accuracy.

95. *See, e.g.*, Roger Lecuyer & Christine Cybula, *Categorization of Geometric Figures Composed of Three or Four Elements by 3-month-old Infants*, CURRENT PSYCHOL. COGNITION 221, 221-44 (2000) (noting studies showing that infants recognize geometric patterns); Dawes, *supra* note 40, at 534 (explaining the problems of representativeness and pseudodiagnosticity as probabilistic fallacies).

information unless they were expected to consider it.[96] People may believe that the information provided to them in such a context is honest, relevant and appropriately specific.[97] Under this rationale, jurors, who understand that information is being screened in this way, may be especially prone to the dilution effect. Experts (like judges) are less likely to suffer from dilution effects, because repeated exposure in the presence of feedback increases the ability to filter irrelevant from relevant information.[98] On the other hand, this effect is made worse if the decisionmaker is accountable.[99] In that case, the decisionmaker searches for all evidence–even irrelevant evidence–that might possibly have bearing on the solution. There is some evidence that group processes decrease the dilution effect.[100] This is true, however, only if the resulting bias is nonsystematic, that is if each member ignores different information. When the irrelevant information plays into commonly held stereotypes, it may skew the decisions in a systematic fashion. The dilution effect explains the harmful consequences of simply permitting the jury to hear expert testimony and then letting the jury try to sort out its relevance for themselves without initial judicial screening for relevance and reliability.

B. Egocentric Biases: Self-Interest and Cognitive Dissonance

People across cultures have a well-documented tendency to overrate their abilities and their control over events, at least when the questions are difficult and the decisionmakers have no prior experience in making such

96. *See* Tetlock et al., *supra* note 80, at 916 (observing that "[f]ar from representing an error, the dilution effect may constitute a rational response to the interpersonal and institutional demands that impinge on individual perceivers").

97. *See id.*

98. *See* Seidenfeld, *supra* note 64, at 504.

99. *See* Tetlock & Boettger, *supra* note 13, at 388; Dawes, *supra* note 40, at 537.

100. *See* Daniel Gigone & Reid Hastie, *Proper Analysis of the Accuracy of Group Judgments*, 121 PSYCHOL. BULL. 149, 155 (1997).

decisions.[101] Across cultures, people appear to overestimate their ability to provide correct answers to questions.[102] People think that they have better judgment than they do.[103] Moreover, this tendency is exacerbated in people acting within small social networks,[104] characterized by having three to fifteen members (a characteristic juries, normally twelve members, share); with someone in a central, coordinating position (here, the judge), and weak contact with outsiders (juries are typically told not to discuss the case with anyone).

The explanations for overconfidence bias are that people "confuse easily drawn inferences for easily remembered facts",[105] people selectively focus on evidence that is consistent with their first impression and ignore inconsistent

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101. *See* Gigerenzer, *supra* note 40, at 297-300 (noting the results of two decades of research showing that test participants were overconfident when judging the correctness of their answers to difficult general knowledge questions, but that when they were directed to assess their correctness with reference to their prior experience in answering similar general knowledge tests, their overconfidence disappears). The problem for jurors is that they do not have any such reference points when it comes to assessing the defendant's dangerousness. The major determinant of overconfidence is the difficulty of the question. *See* Lyle A. Brenner et al., *Overconfidence in Probability and Frequency Judgments: A Critical Examination*, 65 ORG. BEHAV. & HUM. DECISION PROCESSES 212, 213 (1996) (observing that "the major (though not the sole) determinant of overconfidence is the difficulty of the questions"). Overconfidence has been observed in a number of predictive tasks, including physicians' predictions of disease, economists' forecasts of recession, and players' predictions of their opponents' moves. *See id.* at 213 (citing studies). However, as one researcher points out, we do not know if the kind of question domain makes a difference, or "whether there are simply some domains in which we tend to exaggerate the accuracy of our knowledge or judgment (not in others)." Robyn M. Dawes & Matthew Mulford, *The False Consensus Effect and Overconfidence: Flaws in Judgment or Flaws in How We Study Judgment?*, 65 ORG. BEHAV. & HUM. DECISION PROCESSES 201, 210 (1996). Nonetheless, although we do not know whether the results in the general knowledge questions are equally applicable to the decision the jurors make in capital sentencing, if our goal is to improve accuracy, we should implement ways of minimizing such effects.

102. *See* Mitchell, *supra* note 12, at 1113-14 (citing studies showing that, with the exception of Japanese and Singaporeans, Asians are even more overconfident than Westerners).

103. *See* Hart Blanton et al., *Overconfidence as Dissonance Reduction*, 37 J. EXPERIMENTAL SOC. PSYCHOL. 373, 373 (2001) (citing studies asking people to evaluate their ability in solving laboratory problems and showing that "people think that they can solve problems that they cannot, think that they have made progress toward correct solutions when they have not, and think that they have drawn correct conclusions when they have not").

104. *See* Joshua Klayman et al., *Overconfidence: It Depends on How, What, and Whom You Ask*, 79 ORG. BEHAV. & HUMAN DECISION PROCESSES 216, 243 (1999) (finding an overall bias toward overconfidence, particularly in small social networks).

105. Blanton et al., *supra* note 103, at 374 (citing studies).

evidence,[106] and that people's overconfidence is a buffer against anxiety.[107] Overconfidence may be amplified when people tend to take further actions that justify and reinforce decisions that they have already made.[108] For example, gamblers and voters are more confident after they have placed their bets or votes than they were before.[109]

C. Group Dynamics and Polarization Effects

Legal decisionmaking at trial has two aspects: individual, in the person of the judge, and group, in the form of the jury. Although there is strong evidence that group decisions are better than individual decisions when evaluating information that has a demonstrably correct solution,[110] most decisions that juries are called upon to make do not have clear answers.[111] Complex decisions are not necessarily improved by group processes.[112] Moreover, when the individuals in a group share a particular bias, group processes tend to magnify its effect.[113] Group final judgment depends on both where the individual members begin deliberation and the processes in which the group combines preferences to define a group decision.[114] Group

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106. *See id.* (citing studies); Eddie Harmon-Jones & Judson Mills, *An Introduction to Cognitive Dissonance Theory and an Overview of Current Perspectives on the Theory, in* COGNITIVE DISSONANCE: PROGRESS ON A PIVOTAL THEORY IN SOCIAL PSYCHOLOGY 3 (Eddie Harmon-Jones & Judson Mills eds., 1999) (citing studies demonstrating that people selectively seek information that will decrease expected post-decision dissonance).

107. *See* Jeff Greenberg et al., *Why Do People Need Self-Esteem? Converging Evidence that Self-Esteem Serves an Anxiety-Buffering Function*, 63 J. PERSONALITY & SOC. PSYCHOL. 913, 913-21 (1992) (arguing that self-deception sustains the illusion of control and diminishes anxiety).

108. *See* LEON FESTINGER, A THEORY OF COGNITIVE DISSONANCE (1957). Festinger's theory provoked a great deal of controversy, but the empirical basis for it appears to have survived the controversy. *See, e.g.*, Dawes, *supra* note 40, at 557-61, 561 (detailing the controversy and concluding that "cognitive dissonance theory is resilient").

109. *See* Blanton et al., *supra* note 103, at 374 (arguing that "overconfidence reflects the motive to maintain a view of the self as a knowledgeable perceiver who makes sound judgments") (citing studies).

110. *See* Gigone & Hastie, *supra* note 100, at 149.

111. As Gigone and Hastie explain, "groups performing tasks that involve solutions that are not easily demonstrable tend to perform at the level of their average members." *Id.*

112. *See id.*; *see also* Gayle W. Hill, *Group Versus Individual Performance: Are N+1 Heads Better Than One?*, 91 PSYCHOL. BULL. 517, 535 (1982) (stating that "research confirms the belief that the performance of one exceptional individual can be superior to that of a committee, especially if the committee is trying to solve a complex problem and if the committee contains a number of low-ability members") (citations omitted).

113. *See* Gigone & Hastie, *supra* note 100, at 159.

114. *See* Kerr et al., *supra* note 89, at 694.

polarization effects have been demonstrated for attitudes toward capital punishment, judgments about facts, and perceptions about people.[115] In group decisions, although random errors in assessing information tend to cancel each other out, systematic biases may be amplified.[116] Individual biases and group dynamics are thus both important facets of the decisionmaking process.

Although both individual and group decisionmaking are subject to biases–that is, decisions about what and how information is relevant[117]–there are some characteristics of group decisionmaking that emphasize the importance of protecting the jury from irrelevant information that exacerbates biases. Group decisions are better than individual decisions when evaluating information that has a demonstrably correct solution.[118] The reason for this is that the errors of individuals in assessing information tend to cancel each other out.[119] Thus, I am not arguing that the jury should be replaced in criminal trials, or in capital sentencing proceedings. I am suggesting that in the context of sentencing proceedings, the confluence of systematic errors requires that judges carefully screen information that the jury will use to make its collective decision.

The argument that collective decisionmaking should cancel out judgmental errors does not work for systematic biases.[120] In other words, if everyone is making the same (erroneous) assumptions, the result is apt to be far worse than if the decisionmakers were individual. Collective processes under certain conditions skew the decision away from judgmental accuracy.[121] Rather than achieving a compromise solution that reflects the average of the

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115. *See* Paul E. Jones & Peter H.M.P. Roelofsma, *The Potential for Social Contextual and Group Biases in Team Decision-making: Biases, Conditions and Psychological Mechanisms*, 43 ERGONOMICS 1129, 1144 (2000) (discussing the "overwhelming number of studies" demonstrating group polarization).

116. *See* Gigone & Hastie, *supra* note 100, at 159 (observing the cancellation of uncorrelated errors in group decisionmaking).

117. *See* Kerr et al., *supra* note 89, at 714-15 (defining bias as reflecting "decisions about whether and how to use information" and demonstrating that "groups will amplify bias under some conditions but attenuate it under others"); Chip Heath & Rich Gonzalez, *Interaction with Others Increases Decision Confidence But Not Decision Quality: Evidence Against Information Collection Views of Interactive Decision Making*, 61 ORG. BEHAV. & HUM. DECISION PROCESSES 305, 323 (1995) (concluding that individual interactive decisionmaking exhibits similar characteristics to group consensus decisionmaking).

118. *See* Gigone & Hastie, *supra* note 100, at 149.

119. *See id.* at 159 (observing the cancellation of uncorrelated errors in group decisionmaking).

120. *See* Kerr et al., *supra* note 89, at 713-14 (noting that although the law of large numbers suggests that random errors will cancel each other out in collective decisions, it will not do so for systematic errors).

121. *See id.* at 714-15 (citing studies).

members' initial position, groups often polarize; that is, the group will make a more extreme decisions than the individuals' initial positions would have predicted.[122] The result is that group decisions may move toward an extreme position rather than to the middle of the individually held antecedent positions.[123]

For polarization to occur, there must be an initial leaning of the group in a particular direction.[124] There are a number of explanations for this tendency, such as social comparison theory (people initially espouse opinions less extreme than their true opinion because they fear being labeled deviant, and once they realize that others have more extreme opinions they shift theirs' to the true value); persuasive arguments theory (explaining group polarization on the basis of a pool of arguments drawn from discussion among the group members); self-categorization theory (group members define the social identity of the group and then modify their positions to conform with it); social influence network theory (a network of interpersonal influence); and social decisions schemes (the distribution of initial opinions specifies the relative influence of the alternative initial positions of group members).[125] The initial studies of group polarization involved the "risky shift," a choice shift in the direction of risk preference.[126] This does not mean that groups always will be risk seeking. There is also a "cautious shift," but if the context

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122. *See, e.g.*, Daniel J. Isenberg, *Group Polarization: A Critical Review and Meta-Analysis,* 50 J. PERSONALITY & SOC. PSYCHOL. 1141, 1141 (1986) (noting that "an initial tendency of individual group members toward a given direction is enhanced following group discussion").

123. *See id.*; *see also* Cass R. Sunstein, *Deliberative Trouble? Why Groups Go to Extremes*, 110 Yale L.J. 71, 85-86 (2000) (observing that "[t]he effect of deliberation is both to decrease variance among group members, as individual differences diminish, and also to produce convergence on a relatively more extreme point among predeliberation judgments").

124. *See* Noah E. Friedkin, *Choice Shift and Group Polarization*, 64 AM. SOC. REV. 856, 857 (1999) (explaining the concept of group polarization in terms of a choice shift, which occurs "when, after a group's interaction on an issue, the mean final opinion of group members differs from the members' mean initial opinion . . . in the opposite direction of the initial inclination of the group").

125. *See id.* at 857-59 (discussing alternative explanations).

126. *See* James A.F. Stoner, *Risky and Cautious Shifts in Group Decisions: The Influence of Widely Held Values*, 4 J. EXPT'L SOC. PSYCHOL. 442, 443 (1968). The initial studies involved asking study participants to advise engineers about whether to quit a secure job for a riskier one that paid more. The participants were asked at what level of risk the engineer should take the offer and the group assessment of the proper risk level was significantly higher than the members' initial choices. *See id.* at 447. For a discussion of these studies, see Dan Hunter, *Philippic.com*, 90 CAL. L. REV. 611, 641 (2002) (reviewing CASS SUNSTEIN, REPUBLIC.COM (2001)).

is one in which a systemic bias can be predicted, group polarization may magnify the effect.[127]

Essentially, if the group members already have a predilection in attitude, group dynamics intensify the predilection and result in a more extreme judgment.[128] For example, when there is an underlying norm endorsing capital punishment, individuals would attempt to signal that they shared the group attitude.[129] This results in a kind of competition, but since no one can be sure exactly what the average is, the value moves in the direction favored by the group norm.[130] This effect has been observed in studies where the group categorized itself as either risk-taking or cautious and group decisions were observed to polarize in the risky direction by stereotypically risk seeking groups and in the cautious direction by self-perceived cautious groups, although risky and cautious individuals tended to shift away from their individual predilection.[131]

Apparently, this polarization phenomenon is a function of group discussion.[132] One explanation for group polarization is that groups have an internal culture that prefers some values over others.[133] During discussion, group members attempt to signal their adherence to these group norms, but because they do not know ahead of time the level of group adherence to these norms, the result is a competition that shifts the initial preferences to a more extreme level.[134] This means that if group members share a particular bias,

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127. *See* ROGER WILLIAM BROWN, SOCIAL PSYCHOLOGY 211 (2d ed. 1986).

128. As Noah Friedkin explained, "[a] choice shift is said to occur when, after a group's interaction on an issue, the mean final opinion of group members differs from the members' mean initial opinion. Group polarization is said to occur when the choice shift is in the same direction as the mean initial opinion." Friedkin, *supra* note 124, at 857.

129. *See* ROBERT S. BARON ET AL., GROUP PROCESS, GROUP DECISION, GROUP ACTION 73 (1992) (discussing the process of polarization); Robert Steven Baron & Gard Roper, *Reaffirmation of Social Comparison Views of Choice Shifts: Averaging and Extremity Effects in an Autokinetic Situation*, 33 J. PERSONALITY & SOC. PSYCHOL. 521, 528-30 (1976) (hypothesizing that members strive to show adherence to group norms).

130. *See* Seidenfeld, *supra* note 64, at 536 (explaining the competition to express the group norm that results in polarization).

131. *See* John C. Turner et al., *Referent Informational Influence and Group Polarization*, 28 BRIT. J. SOC. PSYCHOL. 135, 143 (1989) (noting that "defining the shared characteristics . . . in advance will ensure that arguments/positions/members in line with the stereotype will tend to be perceived as more representative of the group as a whole and hence more persuasive and valued").

132. *See* BARON ET AL., *supra* note 129, at 73 (noting the "process whereby group discussion tends to intensify group opinion, producing more extreme judgments among group members than existed before [the] discussion").

133. *See* Baron & Roper, *supra* note 129, at 528-30.

134. *See* Glenn S. Sanders & Robert S. Baron, *Is Social Comparison Irrelevant for Producing Choice Shifts?* 13 J. EXPERIMENTAL SOC. PSYCHOL. 303, 311 (1977).

group dynamics may intensify its impact.[135] People wish to be perceived favorably by the group, so they adjust their expressed opinion in line with their image of the group position, an image already polarized because of its prototypical nature.[136]

Another explanation for the polarization effect is that the initial declaration of the individual's position was more moderate than the position the individual really held.[137] During group deliberations, as the individual realizes the group position is more extreme, the individual is freed to express these more extreme views.[138] In this explanation, there is not really a shift in underlying attitudes, but merely an increased willingness to express previously held views. Both this and the prior explanation are social comparison theories, and suggest that group polarization occurs when high status members of the group hold more extreme views than the mean.[139] Thus, if the jury foreperson or other influential member has a predilection for a particular view, that person may shift the group decision. Rather than fracturing the group into opposing views, polarization is a consensual shift further in the direction of the group's initial tendency.[140]

Yet another explanation for group polarization is the persuasive arguments theory.[141] Here, the deciding factors are the number and persuasiveness of the arguments mustered in support of a given position.[142] This theory also relies on a notion of underlying group orientation. Under this theory, group polarization occurs when there is a disproportionately large number of persuasive arguments in the direction the group is leaning.[143]

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135. *See id.* at 304.

136. *See* JOHN TURNER ET AL., REDISCOVERING THE SOCIAL GROUP 156 (1987).

137. *See* Isenberg, *supra* note 122, at 1142.

138. *See id.*

139. *See* George R. Goethals & Mark P. Zanna, *The Role of Social Comparison in Choice Shifts*, 37 J. PERSONALITY & SOC. PSYCHOL. 1469 (1979).

140. *See* James H. Liu & Bibb Latan, *Extremization of Attitudes: Does Thought and Discussion-Induced Polarization Cumulate?*, 20 BASIC & APPLIED SOC. PSYCHOL. 103, 103 (1998) (noting the difference between popular conceptions of polarization and social scientists').

141. *See* Eugene Burnstein & Amiram Vinokur, *What a Person Thinks Upon Learning He Has Chosen Differently from Others: Nice Evidence for the Persuasive-Arguments Explanation of Choice Shifts*, 11 J. EXPERIMENTAL SOC. PSYCHOL. 412 (1975) (discussing shifts in choice even without discussion, based on knowledge of others' preferences).

142. *See id.* at 412.

143. *See* Eugene Burnstein & Amiram Vinokur, *Persuasive Argumentation and Social Comparison as Determinants of Attitude Polarization*, 13 J. EXPERIMENTAL SOC. PSYCHOL. 315 (1977) (polarization as a result of informational influence).

In mock-jury studies,[144] polarization around the question of guilt or innocence has been well documented.[145] In interactive groups, rather than responding to information against their position by modifying their position or lowering their confidence, researchers have found that group members' interaction increases peoples' confidence in their decision in a way that is not

144. Mock jury experiments are frequently castigated as lacking the real-world context of jury deliberations. *See, e.g.*, Michael J. Saks, *What Do Jury Experiments Tell Us About How Juries (Should) Make Decisions?*, 6 S. CAL. INTERDISC. L.J. 1, 7-8 (1997) (noting the differences between live trials and mock jury studies but explaining that the real issue is whether such differences affect generalizability of the study results). In many cases, however, the results of experimental research and studies involving real juror interviews coincide. *See* Neil Vidmar & Shari Seidman Diamond, *Juries and Expert Evidence*, 66 BROOK. L. REV. 1121, 1166-67 (2001) (noting that "the experimental research related to juries and experts produces conclusions consistent with the studies involving juror interviews" and concluding that jurors "generally make reasonable use of complex material, utilizing the expert testimony when it is presented in a form that they can use"). In the polarization studies, the mock jurors were interviewed about their initial determinations, deliberated, and reached a consensus that tended to be more extreme than the initial interviews suggested. *See* Kerr et al., *supra* note 89, at 705 (describing mock juror studies showing a polarization effect in which jurors were exposed to evidence, deliberated in twelve-person juries and provided postdeliberation guilt judgments); BROWN, *supra* note 127, at 227-29 (citing studies). For an article contending that even computers experience group polarization when "fed with the same noisy input and confronted with the same environmental distributions," see Klaus Fiedler, *Explaining and Simulating Judgment Biases as an Aggregation Phenomenon in Probabilistic, Multiple-Cue Environments*, 103 PSYCHOL. REV. 193,198-99, 211 (1996) (discussing group polarization as resulting "from aggregation alone whenever one of two opposite attitudes is dominant," a finding "consistent with the repeated empirical finding that polarization occurs only after unconstrained, extended discussion").

145. *See* BROWN, *supra* note 127, at 227-29 (collecting studies). Very diverse groups tend to diminish this effect. *See* Sunstein, *supra* note 123, at 116 (citing James Fishkin's experiments demonstrating an absence of polarization effects in groups composed of highly diverse individuals). Although juries generally are diverse in many respects, capital juries are not heterogeneous: in order to serve on the jury, jurors must be willing to support the death penalty (in the appropriate case, as the voir dire usually instructs juries). Counter-intuitively, it might be less polarizing to have a diversity of opinions about the legitimacy of the death penalty. *See* Devine et al., *supra* note 50, at 693 (citing evidence from the Capital Jury Project that capital juries tend to polarize toward death rather than life, seemingly contradicting the strong leniency bias observed in mock jury studies).

justified by increased accuracy.[146] Instead, group members frequently fail to respond to the information presented.[147]

In sum, the dilution effect together with the dynamics of group decisionmaking bear on why the *Barefoot* court[148] was mistaken that the jury deliberation is the right phase of the proceeding to sort out good science from bad. The jury's sentencing determination is unanimous, a group decision reached after deliberation, based on ideals of deliberative democracy that argument and reflection among competing views will lead to better–more accurate–outcomes.[149] Such decisions may get hopelessly mired by irrelevant information, skewed by initial tendencies (toward overweighting medical at the expense of other scientific expertise, for example, or in death penalty juries, towards the expert who agrees with death-qualified juries' preconceptions), and stymied by the exertion of an unfamiliar cognitive task (evaluating scientific testimony) for which they have no training and no guidance.

III. AN EXAMPLE OF GATEKEEEPING FAILURE: CAPITAL SENTENCING PROCEEDINGS

The argument in favor of judicial scrutiny might appear to be mere academic meandering in light of *Daubert*'s insistence on judicial gatekeeping.

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146. *See* Heath & Gonzalez, *supra* note 117, at 306 (arguing that interaction does not cause people to assess the available information differently but merely to develop more coherent rationales for their choices and beliefs). Heath and Gonzalez studied interactive decisionmaking–individual decisions made after consultation with the group–and distinguished it from group decisionmaking on the basis that groups must reach a consensus and the "aggregation procedure may hide or distort changes in individual preferences." *Id.* at 307. Jury decisionmaking has facets of both interactive and group decisionmaking; although the end product must be a consensual decision, in order to avoid a hung jury, each juror must individually agree and each can hold out until persuaded. Moreover, Heath and Gonzalez conclude that consensus decisionmaking is not the only kind of group decision that exhibits the characteristics of groupthink. *See id.* at 323. The characteristics of groupthink, "'discount[ing] warnings and other forms of negative feedback that, taken seriously, might lead the group members to reconsider their assumptions'. . . provide[s] a remarkably satisfying description of the phenomenon . . . of individual decision makers interacting in a social environment." *Id.* (quoting Irving J. Janis, *Groupthink*, 5 PSYCHOL. TODAY 43, 44 (1971)).

147. *See id.* at 305.

148. *See* Barefoot v. Estelle, 463 U.S. 880, 901 (1983) (refusing to exclude future dangerousness testimony as a constitutional matter because the defense could not show that "psychiatrists are always wrong with respect to future dangerousness, only most of the time").

149. *See* Sunstein, *supra* note 123, at 73-74 (noting the perceived view that group deliberation yields an outcome that takes everyone's position into account, and contending that, on the contrary, people deliberating in groups tend to polarize their positions from that of any individual member).

Judges already screen for scientific validity, at least in theory. In one important context, however, gatekeeping is tossed to the winds. Ironically, both state and federal courts are lackadaisical about gatekeeping when it comes to capital sentencing.[150] Elsewhere, I have argued that this gatekeeping failure is constitutionally impermissible.[151] Although the sentencing process has even greater potential to be infected with some of the biases described above, the Federal Rules of Evidence–which include the *Daubert* standard for expert witnesses–generally do not apply at federal capital sentencing proceedings,[152] despite the Supreme Court's recognition that capital sentencing requires a "heightened reliability" standard.[153] Nonetheless, by statute, only relevant evidence may be admitted[154] and, as under the Federal Rules of Evidence, if the danger of unfair prejudice outweighs its probative value, even relevant evidence may be excluded.[155] Thus, even if the federal rules do not apply directly, some scientific validity inquiry ought to be applied.

Capital sentencing is by a jury.[156] A common justification for declining to apply the rules of evidence strictly at sentencing is that such proceedings

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150. The Federal Death Penalty Act of 1994 significantly expanded the scope of federal capital crimes. *See* Violent Crime Control and Law Enforcement Act of 1994, Pub. L. No. 103-322, 108 Stat. 1796, 1959 (codified as amended in scattered sections of 18 U.S.C.). *See* Charles Kenneth Eldred, *The New Federal Death Penalties*, 22 AM. J. CRIM. L. 293, 296-98 (1994) (listing 60 capital offenses). *But see* Benjamin Weiser, *Manhattan Judge Finds Federal Death Law Unconstitutional*, N.Y. TIMES, July 2, 2002 at B1 (citing opinion by Judge Jed Rakoff, ruling federal death penalty law unconstitutional). Even in federal cases, however, *Daubert* is generally not invoked at sentencing, because the rules of evidence do not apply. *See, e.g.*, U.S. SENTENCING GUIDELINES MANUAL § 6A1.3(a) (1997) ("In resolving any dispute concerning a factor important to the sentencing determination, the court may consider relevant information without regard to its admissibility under the rules of evidence applicable at trial."); ALA. CODE § 13A-5-45(d) (1994) (providing that "[a]ny evidence which has probative value and is relevant to sentence shall be received at the sentence hearing regardless of its admissibility under the exclusionary rules of evidence").

151. *See generally* Erica Beecher-Monas, *The Epistemology of Prediction: Future Dangerousness Testimony and Intellectual Due Process*, 60 WASH. & LEE L. REV. 353 (2003).

152. *See* 18 U.S.C. § 3593(c) (2000) ("Information is admissible regardless of its admissibility under the rules governing admission of evidence at criminal trials.").

153. *See* 21 U.S.C. § 848(j). *See also* Ford v. Wainwright, 477 U.S. 399, 411 (1986) (setting a "heightened reliability" standard for capital sentencing).

154. *See* 18 U.S.C. § 3593(c) ("[I]nformation may be presented as to any matter relevant to the sentence.").

155. *See* 18 U.S.C. § 3393(a) (analogous to FED. R. EVID. 403).

156. In *Ring v. Arizona*, the Supreme Court ruled that the capital sentencing decision must be made by a jury. *See* Ring v. Arizona, 536 U.S. 584, 609 (2002).

have become a search for justice rather than truth.[157] Putting aside the question of whether they are really separable, justice, in any event, ought to include the search for truth. Rationality and the quest for accuracy, in the context of what is an unabashedly adversarial proceeding, demands that there be some control over what count as facts in the proceeding. The importance of a structured reasoning process for rationality argues for judicial screening of expert testimony.

Expert testimony is prevalent at capital sentencing hearings.[158] In Texas, for example, experts routinely base their testimony entirely on the defendant's conduct at trial and the facts of the crime to opine to future dangerousness with one-hundred-percent accuracy.[159] One Texas expert, Dr. Griffith, was "frequently the state's star witness" and had never once testified that any defendant did not pose a future danger.[160] Judge Garza observed that it is still as true today as it was in *Barefoot's* time that "[n]either the Court nor the State of Texas has cited a single reputable scientific source contradicting the unanimous conclusion of professionals in this field that psychiatric predictions of long-term future violence are wrong more often than they are right."[161]

Without formal requirements of evidentiary rules, there is virtually no structured examination of the scientific basis for such testimony. Absent such a structured examination, the jury has little hope of accurately assessing the alternatives or of making an optimal decision. Irrelevant information may result in poor decisions from the dilution effect. Group polarization may skew the jury's decision in the direction of any initial tendency. The representativeness and overconfidence heuristics are particularly troubling in this regard. For example, the representativeness heuristic may cause the individual jurors to base decisions on the extent to which a particular event (or

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157. The Supreme Court has held that evidentiary standards in the sentencing phase are fairly open because "any aspect of a defendant's character or record and any of the circumstances of the offense [ought to be available to support] a sentence less than death." Lockett v. Ohio, 438 U.S. 586, 604 (1978) (plurality opinion).

158. Expert testimony is frequently proffered at capital sentencing proceedings. For example, in the Capital Jury Project, funded by the National Science Foundation, the California portion of the study examined thirty-six death penalty cases, and found that the prosecution called an expert in eighty-one percent of the cases, and the defense called an expert in ninety percent. *See* Scott E. Sundby, *The Jury as Critic: An Empirical Look at How Capital Juries Perceive Expert and Lay Testimony*, 83 VA. L. REV. 1109, 1120 (1997) (noting that "conventional practice at the penalty phase involves presenting an expert to the jury at some point–in many cases more than one–who will testify based upon an expertise gained through training and study.").

159. *See* Barefoot v. Estelle, 463 U.S. 880, 919 (1983) (Blackmun, J., dissenting).

160. *See* Flores v. Johnson, 210 F.3d 456, 462 (5th Cir. 2000) (Garza, J., concurring).

161. *Flores*, 210 F.3d at 462 (Garza, J., concurring) (quoting *Barefoot*, 463 U.S. at 921 (Blackmun, J., dissenting)).

person) resembles a certain category of events (or fits within their stereotypes of people).[162] If people share a particular bias, polarization may magnify this tendency. Thus, in assessing the probability of future violent behavior for a particular defendant, jurors are likely to think that one violent incident is representative of a pattern, since they are unlikely to know, much less refer to, the probabilities of a recurring incident.[163] In addition, because people frequently overestimate the relevance of memorable incidents at the expense of statistical base rates[164] and make judgments on the basis of what they remember,[165] the jury may share a skewed perception that violent recidivism is common.[166] A shared perception that violent recidivism is common may make the jurors more likely to opt for the death sentence.[167] Judges may be equally swayed by media reports, but group polarization may magnify this initial tendency of individual jurors.

In addition, because the jury has recently heard in graphic detail how the defendant committed one atrociously violent act, they are likely to believe that it is representative of the way the defendant will behave in the future. The

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162. *See* Kahneman & Tversky, *supra* note 92, at 431 (defining the representativeness heuristic as evaluating "the probability of an uncertain event, or a sample, by the degree to which it is: *(i)* similar in essential properties to its parent population; and *(ii)* reflects the salient features of the process by which it is generated" so that a characteristic is matched to a category and the probability evaluated in terms of the closeness of the match). The classic study on this bias was that of Meehl and Rosen, who documented the degree that psychiatric diagnoses made in staff meetings ignored population base rates. *See* Paul E. Meehl & Albert Rosen, *Antecedent Probability and the Efficiency of Psychometric Signs, Patterns, or Cutting Scores*, 52 PSYCHOL. BULL. 194 (1955). A simple example is that "a politician of erect bearing walking briskly to the podium is likely to be seen as strong and decisive; this is an example of judgment by representativeness." Kahneman & Tversky, *Reality*, *supra* note 94, at 582.

163. *See* Dawes, *supra* note 40, at 532 (explaining the fallacy of "considering the probability of the evidence given the hypothesis . . . without looking at . . . the prior odds").

164. *See* Tversky & Kahneman, *Availability*, *supra* note 94, at 163. This is known as the availability heuristic. *See id.*

165. "For example, a judgment of the prevalence of suicide in a community is likely to be mediated by the ease with which instances come to mind; this is an example of the availability heuristic." Kahneman & Tversky, *Reality*, *supra* note 94, at 582.

166. The number of dramatic deaths, for example, were greatly overestimated by medical student and physician participants in a study that asked participants to estimate the number of deaths due to each of forty-two diseases. *See* Jay J.J. Christensen-Szalanski et al., *Effects of Expertise and Experience on Risk Judgments*, 68 J. APPLIED PSYCHOL. 278 (1983).

167. Interviews with capital jurors, for example, found that jurors overwhelmingly underestimated the amount of time a defendant would have to serve before becoming eligible for parole, relying primarily on memory of vivid media accounts of violent recidivism. *See* William J. Bowers & Benjamin D. Steiner, *Death by Default: An Empirical Demonstration of False and Forced Choices in Capital Sentencing*, 77 TEX. L. REV. 605, 671-72 (1999) (discussing the interviews of 916 capital jurors in the Capital Juror Project).

representativeness heuristic suggests that jurors do not refer to base rates (of which they are usually ignorant in any event) in their decision making process. The anchoring heuristic suggests that because the jurors first learned about the defendant in the context of a graphically violent crime, they are likely to persist in thinking of the defendant as violent, even in the face of contrary evidence.[168] People frequently arrive at a decision that varies according to their starting point.[169] The availability heuristic, which is the tendency of people to confuse the facility with which they can recall an event with its likelihood of recurrence,[170] suggests that the jurors' vivid recollection of a horrendous crime the defendant committed will be confused with future propensities for violence. The overconfidence bias similarly may have unforeseen consequences in the context of capital sentencing.

The jury has already decided that the defendant is a very dangerous person when it found the defendant guilty, and the overconfidence bias will tend to make them be more confident in their action–a guilty verdict–than the facts would suggest. Any information that supports their decision is likely to have a disproportionate impact on their sentencing decision, due to the related phenomenon of cognitive dissonance.[171] This appears to be what happens in capital sentencing: capital jurors overwhelmingly focus on the question of guilt even after the verdict has been rendered and they are supposed to be focusing on the separate question of the appropriate punishment.[172] Overconfidence and cognitive dissonance suggest that jurors may be overconfident in their decision of guilt and subsequently overvalue the expert

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168. Anchoring is the tendency for arbitrary starting points to influence decisions. *See* Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, 185 SCI. 1124, 1128-29 (1974).

169. For example, when asked to estimate percentages of United Nations countries that are African after being exposed to the result of a roulette wheel–an obviously random and irrelevant value–people responded with marked differences according to the value spun on the wheel (the median answer of people for whom the value on the wheel was 10 was considerably lower than that for people exposed to a wheel value of 65). *See id.* This seemingly irrational behavior is explained by cognitive psychologists as the anchoring effect, in which decisions are made according to some (perhaps irrelevant) starting value.

170. *See* Tversky & Kahneman, *Availability*, *supra* note 94, at 163 (describing the availability heuristic and the cognitive biases that may result).

171. Cognitive dissonance is a phenomenon in which people will adjust their attitudes and beliefs in order to justify a previously undertaken decision or course of action. *See* FESTINGER, *supra* note 108.

172. *See* Ursula Bentele & William J. Bowers, *How Jurors Decide on Death: Guilt is Overwhelming; Aggravation Requires Death; and Mitigation Is No Excuse*, 66 BROOK. L. REV. 1011,1017-19 (2001) (describing the capital juror project and its findings that jurors continue to focus on guilt after the verdict and that they appear to ignore, discredit and devalue mitigating evidence even when it appears to be extensive and credible).

prediction that confirms their decision, giving disproportionate weight to any information that confirms their initial decision of guilt.[173] This is another reason to exclude testimony unsupported by data, such as when an expert testifies with more certainty than is warranted (i.e., the statement that he can be "one-hundred percent certain" that the defendant will kill again).

CONCLUSION

There are a number of reasons that judicial gatekeeping–screening for accuracy before permitting expert testimony–makes for more accurate judgments.[174] As Robert Burns explains, the question that should be asked with regard to admissibility, is whether the evidence at issue would throw the jury "off track" in its goal of reaching the public truth.[175] The dilution effect explains the importance of screening irrelevant information from jury decisionmaking. People participating in experiments expect that information given to them for the purpose of making a decision is relevant.[176] Similarly, jurors, who already participated in the guilt phase of the trial, have experienced judicial screening, and may expect that whatever information they are given is relevant to their task.[177] When it is not, the decision will be less accurate than had such evidence been excluded.

Judges, however, are aware that they are hearing both relevant and irrelevant information, and they are accountable to their reviewing courts. The dilution effect disappears when people are made accountable for their judgment–as judges are by judicial review–as long as the decisionmaker

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173. *See, e.g.*, Ziva Kunda, *The Case for Motivated Reasoning*, 108 PSYCHOL. BULL. 480 (1990) (observing that people will often construct theories and use evidence in ways that make their final inferences come out the way they want them to).

174. As discussed earlier in this article, to call something an "accurate" judgment is a normative statement that raises complex issues about what we know, how we know it and what our goals are. In the context of the goals of a capitol juror, the jury appears to focus on the goal of determining whether this defendant would kill again if released. Interviews with capitol jurors reflect this overwhelming concern. *See generally* Bowers & Steiner, *supra* note 167 (discussing the Capital Juror Project). The arguments of lawyers and legal scholars that the question ought to be whether the defendant will pose a threat to other inmates or prison personnel are beside the point. My point is simply that in light of their goal, the presentation of irrelevant, unscientific, expert testimony makes their determination less accurate.

175. *See* ROBERT P. BURNS, A THEORY OF THE TRIAL (1999).

176. *See generally* Tetlock et al., *supra* note 80.

177. For example, Tetlock and his co-authors found that even when test participants were told that the information was randomly generated from a computer, and contained both relevant and irrelevant information, they still made more regressive estimates given the irrelevant information. *See id.* at 926.

knows that both relevant and irrelevant information are being presented.[178] Even when you tell unaccountable individuals (and jurors are unaccountable because they never need to explain the reason for their decision)[179] that they are receiving both relevant and irrelevant information and that they need to sort through it to reach their decision, the dilution effect occurs.[180] Irrelevant and inaccurate information throws group decisions off track even more than it does individual judgment. Thus, the dilution effect suggests that merely presenting evidence that counters the misinformation may not be enough.

Moreover, judges are experts, in the sense that they make repeat decisions, in the presence of feedback. People who repeat the decision making-process many times in the presence of feedback regarding their accuracy (as judges do because of the appellate process) are more likely to make accurate judgments.[181] Judges get more feedback than juries through the appellate process, and through legal scholarship and commentary. Expertise tends to decrease both technical errors and the consideration of irrelevant information.[182] Experts–such as judges–trained in decision rules (such as the analysis required under *Daubert*) tend to make better judgments about validity than laypeople–jurors–who are unaware of these rules.[183] Training can improve reasoning.[184] Judges, who have extensive training in legal analysis and, post-*Daubert,* in reasoning about expert testimony, can be expected to make better evaluations of such testimony than untrained jurors. In addition,

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178. *See id.* at 930-31 (demonstrating that "the dilution effect disappears among accountable subjects who were explicitly told that conversational norms did not apply because the information they had been given had been randomly selected from a computer database . . . [or] when conversational norms were explicitly deactivated").

179. Even if one assumed that jurors were accountable, in the sense that they must render a public decision, and may have to explain their reasons to friends and family, it is only the accountability to unknown audiences that appears to affect the care with which information is scrutinized. *See* Tetlock & Boettger, *supra* note 13, at 388 (defining accountability).

180. *See* Tetlock et al., *supra* note 80, at 931 (demonstrating that "explicitly deactivating conversational norms was not sufficient to eliminate the dilution effect among unaccountable subjects").

181. Rachlinski gives the example of reinsurers. *See* Rachlinski, *supra* note 53, at 739.

182. *See* Seidenfeld, *supra* note 64, at 499.

183. *See* Lerner & Tetlock, *supra* note 67, at 263 (explaining that accountability, which may attenuate biases resulting from lack of effort or self-critical awareness, has no effect on judgment tasks requiring knowledge of formal decision rules that are unfamiliar to the decisionmaker).

184. *See* Mitchell, *supra* note 12, at 1119 (citing studies showing the effect of training on increasing the accuracy of decisionmaking).

although the overconfidence bias may afflict experts more than novices,[185] groups are more prone to it than individuals.[186]

Further, accountability can significantly improve the quality of some kinds of judgment.[187] Individual judgments under conditions of accountability are more likely to be careful and thoughtful than group judgments without individual accountability.[188] Judges are accountable not only to their superior courts, but also to a wider audience of legal scholars and practitioners who will comment on their decision. Accountability to an unknown audience enhances careful decisionmaking.[189] People who know that they will have to justify their decisions ahead of time, as judges do, perform better cognitively.[190] Moreover, when the accountability review evaluates the process resulting in the judgment rather than the outcome, such process judgments are improved under conditions of accountability.[191] The

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185. *See* Seidenfeld, *supra* note 64, at 498 (noting that overconfidence in their predictions is a "bias to which experts may be more prone than novices").

186. *See* Philip E. Tetlock et al., *Assessing Political Group Dynamics: A Test of the Groupthink Model*, 63 J. PERSONALITY & SOC. PSYCHOL. 403, 419 (1992) (noting that "groupthink promoted rigid and self-righteous patterns of thinking").

187. *See* Taylor, *supra* note 78, at 76 ("Accountability for one's inferences produces more thorough and more elaborate processing that takes account of more information and that is, at least sometimes, more accurate than processing that occurs in the absence of accountability"). Because the conditions of judicial gatekeeping review are precisely those that increase accuracy, it is the judge who should be the locus of the decision about admissibility of expert testimony, rather than the jury. *Cf.* Seidenfeld, *supra* note 64, at 509 (explaining that judicial review of agency decisionmaking falls within the definition of accountability because courts examine the arguments pertaining to the validity of agency reasoning). Like judicial review of agency decisions, judicial review of gatekeeping determinations similarly examine the basis on which the determination was made.

188. *See* Bettenhausen, *supra* note 77, at 361 (citing studies demonstrating that people in groups of sixteen who shared responsibility for the judgment task "used less complex judgement [sic] strategies than subjects working alone" although "multiple judges who expected to justify their judgments worked as hard as individual judges").

189. *See* Lerner & Tetlock, *supra* note 67, at 256 (explaining that "people often seek approval from their respective audience" and that if "audience views are known prior to forming one's own opinion, conformity becomes the likely coping strategy" and the result is likely to decrease rather than increase accuracy as it does when the audience is unknown).

190. *See id.* (noting that while post-decisional accountability leads to self-justification rather than self-criticism and thus poor decision performance, people that know they will be held accountable before engaging in the judgment task tend to be highly self-critical and more accurate).

191. *See id.* at 258 (citing studies showing that "accountability for decision outcomes–rather than decision processes–would increase the escalation of commitment to prior courses of action . . . . [while] [p]rocess accountability, by contrast, would (a) lead decision makers to engage in more evenhanded evaluation of alternatives and (b) decrease the need for self-justification").

gatekeeping decision of the judge is reviewable primarily for its process rather than its outcome,[192] so one would expect a more careful and critical evaluation of the evidence than could be expected from jurors, who at most may have some outcome accountability in terms of possible negative consequences from their community.

Daubert is unequivocal that relevance in the context of expert testimony means scientific validity.[193] Relevance is not "merely" a matter of evidentiary rules, it is a constitutional minimum, a requirement of due process and a fundamental fairness requirement of the rule of law. Contrary to the Court's contention in *Barefoot*,[194] the adversary process cannot be trusted "to sort out the reliable from the unreliable evidence and opinion about future dangerousness."[195] Rather, as the Supreme Court explained in *Daubert*, the requirement that expert testimony be helpful to the jury, "supported by appropriate validation–*i.e.*, 'good grounds,' based on what is known", is a condition of relevance.[196] This is the task of the judge, and the rule of law emphasis on rationality underscores why this should be so.

192. *See* Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 583 (1993).
193. *See Daubert*, 569 U.S. at 591.
194. *See* Barefoot v. Estelle, 463 U.S. 880, 900 (1983).
195. *Barefoot*, 463 U.S. at 901.
196. *Daubert*, 509 U.S. at 590.